

## 6972 4W Common Interface Module

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### 1. general description

1.01 The Tellabs 6972 4Wire Common Interface module (figure 1) is designed to interface a 4wire transmission facility with a 4wire metallic loop or PBX trunk. As such, the 6972 module provides the functions of a 4wire-to-4wire pad/transformer. Both adjustable transmission attenuation and switch-selectable choice of facility-side terminating impedance are provided. In addition, the 6972 accepts several types of optional signaling converter plug-on subassemblies that provide various modes of loop-to-E-and-M or E-and-M-to-duplex (DX) signaling conversion. The loop and DX converters extend signaling and supervision to a distant location by accessing simplex leads derived via the line transformers that interface the metallic 4wire facility.

1.02 Levels in both the transmit and receive channels may be prescription-set via front-panel switches that introduce up to 26.5dB of attenuation, in 0.1dB increments, into the equipment-side transmit and receive paths.

1.03 Switch-selectable 1200, 600, or 150-ohm impedance-matching options are provided on the facility side of the 6972 module. Equipment-side terminating impedance is fixed at 600 ohms.

1.04 The 6972 module is designed to accept Tellabs' series of 9961X loop-to-E-and-M and E-and-M-to-DX Signaling Converter plug-on subassemblies. The 9961A subassembly, when used on the 6972, provides conversion between E-and-M signaling over the 4wire facility and foreign-exchange station-end (FXS) loop signaling. The 9961B subassembly provides conversion between E-and-M signaling and foreign-exchange office-end (FXO) loop signaling. The 9961D subassembly provides conversion between E-and-M signaling and DX signaling. An option switch on the 6972's printed circuit board reverses simplex access to the facility-side tip and ring pairs in DX signaling applications. For complete information on the 9961X subassemblies, refer to the separate Tellabs Practices on these subassemblies.

1.05 The front panel of the 6972 contains two light-emitting diodes (LED's) that light to indicate seizure in either direction (i.e., to indicate local E-lead and M-lead status). Front-panel transmit and

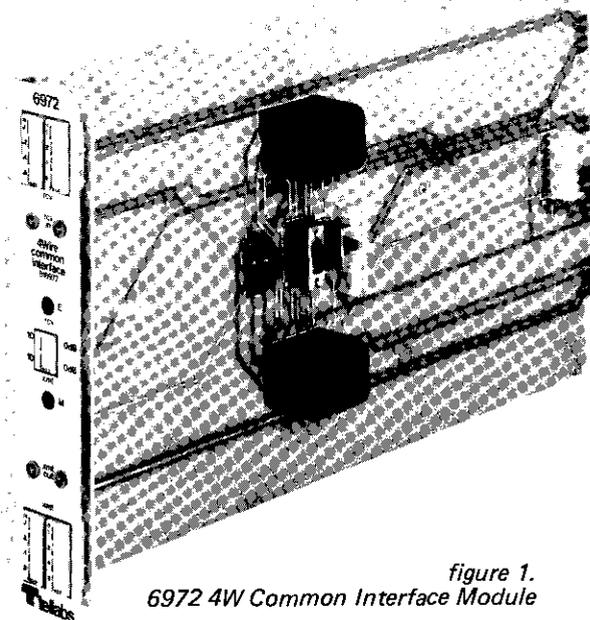


figure 1.  
6972 4W Common Interface Module

receive test points allow bridging access to the transmit output and receive input paths.

1.06 When used without an associated 9961X Signaling Converter subassembly, the 6972 module is completely passive except for its front-panel LED's and thus requires no external power connections unless it is desired that these LED's be functional. Because the 9961X subassemblies are active devices, however, the 6972, when equipped with a 9961X, must be powered from filtered  $-42$  to  $-56$ Vdc input.

1.07 The 6972 module mounts in one position of a Tellabs Type 16 Mounting Shelf, versions of which are available for 19-inch or 23-inch relay rack installation. Both versions accommodate up to 12 modules and occupy 4 rack mounting spaces (7 inches of vertical rack space).

1.08 A companion module, the Tellabs 6971 Common Interface module, is functionally equivalent to and pin-for-pin compatible with the 6972 module. Additionally, the 6971 provides 4wire-to-2wire conversion via switch option.

### 2. application

2.01 The 6972 4Wire Common Interface Module is designed to interface a 4wire transmission facility (typically, a carrier channel) with a 4wire metallic loop terminated in a CO or PBX line circuit, a station instrument, or a DX signaling unit. In the majority of its applications, the 6972 will be equipped with a Tellabs 9961X plug-on Signaling Converter subassembly to provide conversion between E-and-M signaling and either foreign-exchange or DX signaling. In this configuration (i.e., when equipped

with a 9961X subassembly), the 6972 is a compact, single-module unit that performs the functions of both a signaling converter module and an associated 4wire-to-4wire pad/transformer module.

2.02 The 6972 may also be used without a 9961X subassembly as an ordinary 4wire-to-4wire pad/transformer module. Use of the 6972 in this capacity, however, will normally be limited to prewired bay applications because other applications requiring a term set or pad/transformer module without a companion signaling converter may often be accommodated more economically through use of other Tellabs modules (e.g., Tellabs' 420X Term Sets and 440X Pad/Transformer modules). A companion module, the Tellabs 6971 Common Interface module, is functionally equivalent to and pin-for-pin compatible with the 6972. In addition to providing all the functions of the 6972, the 6971 module provides switch-selectable conversion from 4wire operation to 4wire-to-2wire operation.

2.03 The 6972's facility-side impedance may be switch-optional for 1200, 600, or 150 ohms. These impedance-matching options permit the 6972 to interface a variety of facility-side equipment. The 1200-ohm option is selected when the 6972 interfaces loaded cable. The 600-ohm option is selected when the 6972 interfaces nonloaded cable or station equipment, and the 150-ohm option is selected to interface nonloaded cable in applications where a nominal degree of slope equalization is required. The 6972's equipment-side impedance is fixed at 600 ohms.

**use with 9961A subassembly**

2.04 The 9961A Signaling Converter FXS (foreign exchange, station) subassembly, when mounted on the 6972 module, provides conversion between E and M signaling and loop signaling conventionally used at the station end of a foreign-exchange circuit (figure 2). Specifically, the 9961A converts E-lead signals to ringing and tip-ground supervision toward the station, and also converts loop supervisory and dialing signals from the station to M-lead outputs.

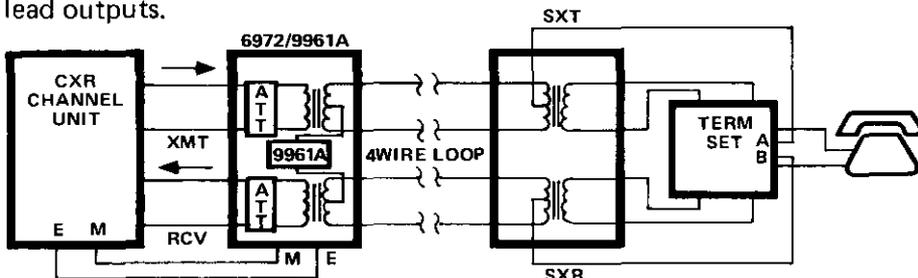


figure 2. Typical application of 6972 equipped with 9961A

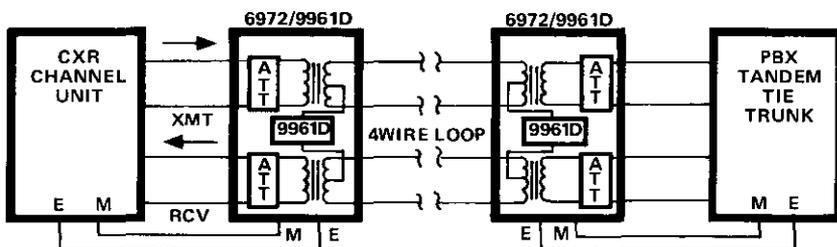


figure 3. Typical application of 6972 equipped with 9961D

2.05 The 9961A accommodates local ring trip during either ringing or silent intervals and includes an integral ringing interrupter that provides 2-second-on, 4-second-off ringing. Both loop-start and ground-start applications are accommodated.

2.06 Use of the 9961A subassembly and associated 6972 module is not restricted to foreign exchange applications. The 9961A and 6972 may be used, for example, to provide loop-to-E-and-M conversion at the station end of an off-premise extension circuit. Also, automatic ringdown operation may be accommodated by equipping both ends of an E-and-M facility with a 6972 and 9961A.

**use with 9961B subassembly**

2.07 The 9961B Signaling Converter FXO (foreign exchange, office) subassembly, when mounted on the 6972 module, provides conversion between E-and-M signaling and loop signaling conventionally used at the office (i.e., switching equipment) end of a foreign-exchange circuit. Specifically, the 9961B converts E-lead signals to loop signaling for operation of the switching equipment, and also converts loop supervisory and ringing signals from the switching equipment to M-lead outputs.

2.08 Like the 9961A, the 9961B subassembly is not restricted to foreign exchange applications. With its companion 6972 module, the 9961B may be used to provide loop-to-E-and-M conversion at the office end of an off-premise extension circuit. The 9961B will also accommodate both loop-start and ground-start operation.

**use with 9961D subassembly**

2.09 The 9961D Signaling Converter DX subassembly, when mounted on the 6972 module, provides extended E-and-M-lead (DX) signaling, i.e., conversion from E-and-M-lead signaling to DX signaling, over a 4wire facility (figure 3). Maximum range of the 9961D is 5000 ohms loop resistance. The 9961D may be switch-optional for either DX1 or DX2 operation. In the DX1 mode, M-lead signals are input to the module and E-lead signals are output. In the DX2 mode, M-lead signals are output, and E-lead signals are input.

In the DX2 mode, M-lead signals are output, and E-lead signals are input.

**Note:** The 9961D subassembly derives the DX signaling path via simplex associated with the 4wire line interface transformer. When using the 9961D with the 6972 module, the A and B lead capacitor (switch S4 on the 9961D subassembly) is usually set to the 0μF position.

2.10 A NORM/REV switch on the 6972 permits reverse simplex access to the facility-side tip and ring pairs. This reversal option may be used to accommodate signaling reversals without need for recabling when a standard wiring scheme is used at both ends of the circuit.

2.11 For complete application, installation, optioning, and alignment information of the 9961A, 9961B, and 9961D subassemblies, refer to the separate Tellabs Practice on each device.

### 3. installation inspection

3.01 The 6972 4Wire Common Interface Module should be visually inspected upon arrival in order to find possible damage incurred during shipment. If damage is noted, a claim should immediately be filed with the carrier. If stored, the module should be visually inspected again prior to installation.

#### mounting

3.02 The 6972 module mounts in one position of the Tellabs Type 16 Mounting Shelf, which is available in configurations for both 19-inch and 23-inch relay rack installation. The module plugs physically and electrically into a 56-pin connector at the rear of the Type 16 Shelf.

#### installer connections

3.03 In many cases, the 6972 module will be installed in Type 16 Mounting Shelves with connectorized backplanes. External connections are made via plug-ended cables that are mated to connectors on the backplane of the Shelf. Before plugging modules into place, proper external connections and proper input fusing should be verified, and each module should be properly optioned.

3.04 If Type 16 Shelves without connectorized backplanes are used, external connections are made via wire-wrap to the 56-pin connector at the rear of each module's mounting shelf position. Pin numbers are found on the body of the 56-pin connector. Again, modules should be put into place only after verifying wiring, fusing, and option selection. Table 1 lists external connections required when non-connectorized Type 16 Shelves are used.

connect:	to pin:
XMT FACILITY T (facility-side transmit tip) . . . . .	7
XMT FACILITY R (facility-side transmit ring) . . . . .	5
RCV FACILITY T (facility-side receive tip) . . . . .	51
RCV FACILITY R (facility-side receive ring) . . . . .	49
XMT EQP T (equipment-side transmit tip) . . . . .	3
XMT EQP R (equipment-side transmit ring) . . . . .	1
RCV EQP T (equipment-side receive tip) . . . . .	55
RCV EQP R (equipment-side receive ring) . . . . .	53
M LEAD . . . . .	19
E LEAD . . . . .	21
RG (ring generator) . . . . .	23
RGR (ring generator dc ringing bias) . . . . .	17
SG (signal ground) . . . . .	35
SB (signal battery) . . . . .	33
-48V (-42 to -56Vdc input) . . . . .	15
GND (ground) . . . . .	25

table 1. External connections to 6972

#### option selection

3.05 Two option switches must be set before the 6972 is placed into service. The location of each switch on the 6972's printed circuit board is shown in figure 4. These switches and their functions are described in paragraphs 3.06 and 3.07.

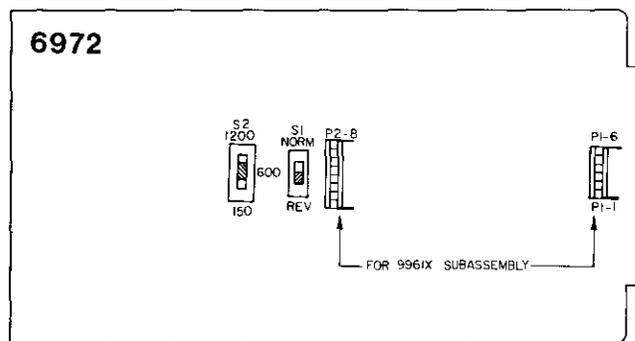


figure 4. Option switch locations

3.06 Switch S1 selects either reverse or normal operation of the facility-side tip and ring pairs in DX-signaling applications. Set switch S1 to the NORM position for normal operation or to the REV position for reversed operation.

3.07 Switch S2 is used to select either 1200, 600, or 150-ohm terminating impedance on the module's facility-side transmit and receive ports. Set S2 to the 1200, 600, or 150 position, as required. In general, select the 1200 position when the 6972 interfaces loaded cable, the 600 position when the 6972 interfaces nonloaded cable or station equipment, or the 150 position when the 6972 interfaces nonloaded cable and a nominal degree of slope equalization is required.

#### alignment

3.08 Alignment consists of adjusting the variable attenuators at the equipment-side ports in accordance with circuit requirements. Align the 6972 as directed below.

**Note:** The following alignment procedure will be expedited if a Tellabs 9807 Card Extender or an external jackfield is used to access the module's equipment-side and facility-side ports. If a Card Extender or jackfield is not used, these ports may be accessed via the module's connector pins. Because external connections must be temporarily removed from these pins, this last method of access is not recommended. Pin numbers as well as 9807 jack designations are provided in the instructions that follow.

3.09 **Transmit Attenuator.** Condition a transmission measuring set (TMS) to output 1000Hz tone at the impedance and level specified for the circuit, and insert this tone at the facility-side transmit port (4W XMT DROP jack on 9807 or pins 5 and 7). Connect the receive portion of the TMS arranged for 600-ohm terminated measurement, to the equipment side transmit port (XMT SF OUT jack or pins 1 and 3), and measure the transmit level. Set the front-panel xmt att switches to derive the level specified for the circuit under test.

3.10 **Receive Attenuator.** Request the distant facility-side location to send 1000Hz tone toward the transmission equipment. If you are using a 9807 Card Extender, insert an opening plug into the RCV SF OUT jack. If you are accessing the module's ports via its connector pins, remove the module from its shelf position. Then, using the

TMS terminated into 600 ohms, measure the received level at the equipment-side receive port (4W RCV DROP jack or pins 55 and 53). When this level is consistent with circuit specifications, remove the opening plug (if used), disconnect the TMS from the equipment-side receive port, and, if the 6972 was removed from its shelf position, reinsert it. Then connect the TMS (with appropriate termination) to the facility-side receive port (RCV LINE MON jack or pins 49 and 51). Set the front-panel *rcv att* switches to derive the receive level specified for the circuit at the facility-side receive port.

#### 4. circuit description

**Note:** The following circuit description covers only the 6972 module itself; the 9961X subassemblies are described in the separate Tellabs Practices on these units. Please refer to the 6972 block diagram, section 5 of this Practice, as an aid in understanding this circuit description.

4.01 The 6972 4Wire Common Interface Module is a conventional 4wire-to-4wire pad/transformer module. The transmit and receive sections are identical. Each section consists of an impedance-matching transformer, arranged as a repeat coil, a common switch that provides 1200, 600, or 150-ohm facility-side impedance options, and an adjustable T-pad attenuator that provides the means of level coordination.

4.02 A NORM/REV switch provides a means of reversing simplex access to the tip and ring pairs on the module's facility side. Four front-panel test points are provided to bridge the equipment-side transmit and receive pairs.

#### 6. specifications

*equipment-side port impedance*

600 ohms, resistive

*facility-side port impedance*

150, 600 or 1200 ohms, switchable

*attenuation range*

transmit and receive: 0 to 26.5dB in 0.1dB increments, switchable

*echo return loss*

20dB minimum

*insertion loss*

1dB nominal at 1000Hz

*frequency response*

±0.5dB re 1000Hz level, 300 to 4000Hz

*longitudinal balance*

60dB minimum, 200 to 4000Hz, any port, facility side

*SX current capacity*

100mA maximum, 5mA maximum unbalance

*operating environment*

20° to 130° F (-7° to 54° C), humidity to 95% (no condensation)

*dimensions*

6.71 inches (17.04cm) high

1.42 inches (3.61cm) wide

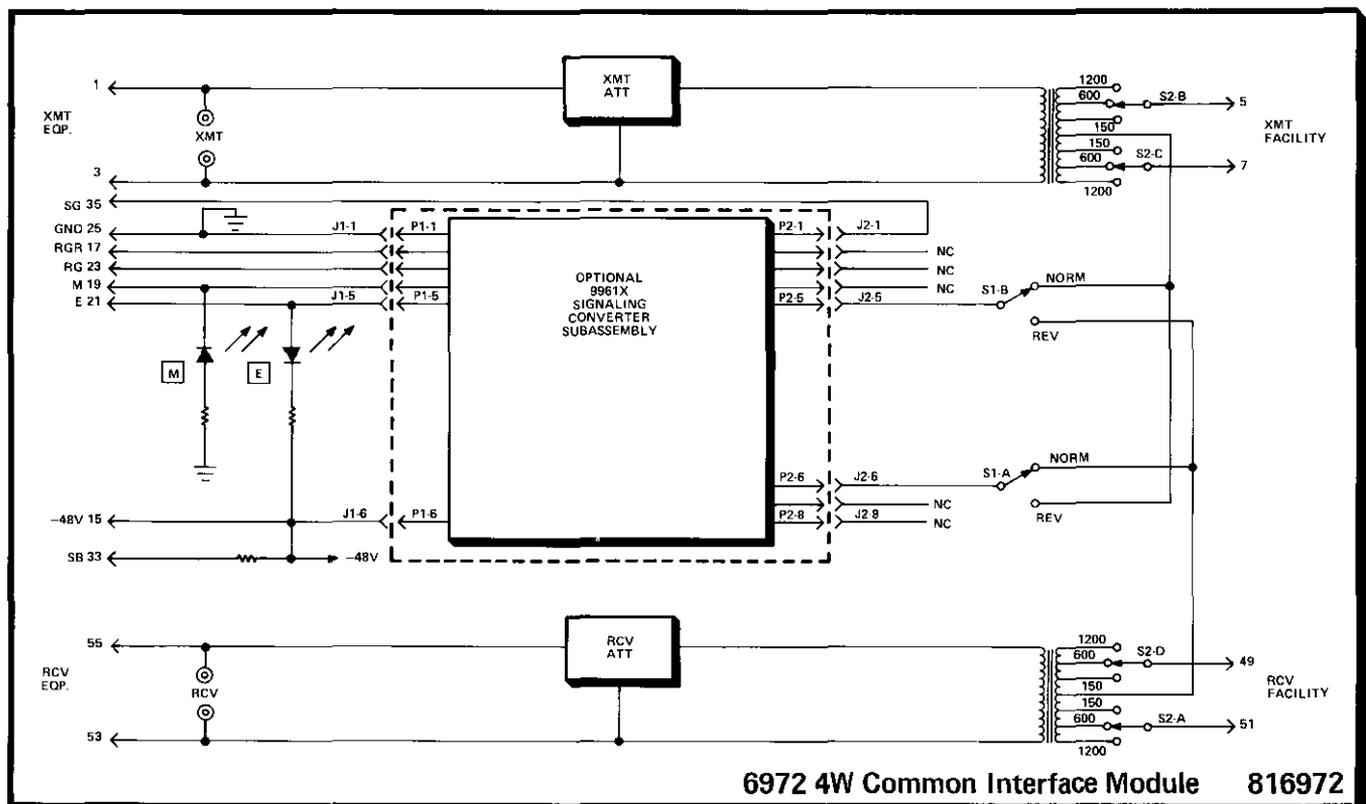
12.94 inches (32.87cm) deep

*weight*

11 ounces (3.08g)

*mounting*

relay rack via one position of Tellabs Type 16 Mounting Shelf



6972 4W Common Interface Module 816972

5. block diagram

**7. testing and troubleshooting**

7.01 The Testing Guide Checklist may be used to assist in the installation, testing or troubleshooting of the 6972 4Wire Common Interface Module. The Testing Guide Checklist is intended as an aid in the localization of trouble to a specific module. If a module is suspected of being defective, a new module should be substituted and the test conducted again. If the substitute module operates correctly, the original module should be considered defective and returned to Tellabs for repair or replacement. It is strongly recommended that no internal (component level) testing or repairs be attempted on the 6972 module. Unauthorized testing or repairs may void the 6972's warranty.

7.02 If a situation arises that is not covered in the Checklist, contact Tellabs Customer Service at (312) 969-8800 or your Tellabs Regional Office for further assistance.

7.03 If a 6972 is diagnosed as defective, the situation may be remedied by either *replacement* or *repair and return*. Because it is the more expedient method, the *replacement* procedure should be followed whenever time is a critical factor (e.g., service outages, etc.).

**replacement**

7.04 If a defective 6972 is encountered, notify Tellabs via telephone [(312) 969-8800], letter [see

below], or twx [910-695-3530]. Notification should include all relevant information, including the 8X6972 part number (from which we can determine the issue of the module in question). Upon notification, we shall ship a replacement 6972 to you. If the warranty period of the defective module has not elapsed, the replacement module will be shipped at no charge. Package the defective 6972 in the replacement module's carton; sign the packing list included with the replacement 6972 and enclose it with the defective module (this is your return authorization); affix the preaddressed label provided with the replacement module to the carton being returned; and ship the equipment prepaid to Tellabs.

**repair and return**

7.05 Return the defective 6972 module, shipment prepaid, to: Tellabs Incorporated  
4951 Indiana Avenue  
Lisle, Illinois 60532  
Attn: repair and return dept.

Enclose an explanation of the module's malfunction. Follow your company's standard procedure with respect to administrative paperwork. Tellabs will repair the module and ship it back to you. If the module is in warranty, no invoice will be issued.

**testing guide checklist**

**Note 1:** *The following test procedure will be expedited if a Tellabs 9807 Card Extender or an external jackfield is used to access the module's 4wire ports. If a Card Extender or jackfield is not used, these ports may be accessed via the module's connector pins. Because external connections must be temporarily removed from these pins, this last method of access is not recommended. Pin numbers as well as 9807 jack designations are provided in the checklist.*

**Note 2:** *For testing and troubleshooting information on the 9961X Signaling Converter subassemblies, refer to the separate Tellabs Practices on these units.*

**Note 3:** *If either the 1200 or 150-ohm impedance-matching option has been selected (paragraph 3.07), option switch S2 for 600 ohms while performing the following test procedure. Be sure to reoption S2 after completing the test.*

test	test procedure	normal result	if normal conditions are not met, verify:
transmission continuity	Using a properly terminated TMS, minated (600 ohms) ac voltmeter, measure transmission continuity at 1000Hz from equipment-side transmit port ( <i>XMTSF OUT</i> jack or pins 1 and 3) to facility-side transmit port ( <i>4W XMT DROP</i> jack or pins 5 and 7) and from facility-side receive port ( <i>RCV LINE MON</i> jack or pins 49 and 51) to equipment-side receive port ( <i>4W RCV DROP</i> jack or pins 55 and 53).	Signal appears at output port at specified level <input type="checkbox"/> .	Power <input type="checkbox"/> . Wiring <input type="checkbox"/> . Attenuator settings <input type="checkbox"/> . Impedance properly set <input type="checkbox"/> . Facility on either side of module <input type="checkbox"/> . Replace and retest <input type="checkbox"/> .
transmission level	Vary signal levels via front-panel <i>rcv att</i> and <i>xmt att</i> switches.	Signal levels follow switch settings <input type="checkbox"/> .	Power <input type="checkbox"/> . Wiring <input type="checkbox"/> . Attenuator settings <input type="checkbox"/> . Impedance setting <input type="checkbox"/> . Replace 6972 and retest <input type="checkbox"/> .

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